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(54) Heat sealable barrier material for improved juice packaging

Heissversiegelbares Sperrmaterial für Saftpackung

Matériau barrière soudable à chaud pour l'emballage de jus

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Description**BACKGROUND OF THE INVENTION**

5 The invention relates to a container for liquids containing essential oils and/or flavours, said container being constructed from a laminate.

More particularly, this invention relates to barrier laminates which are comprised of an improved heat-sealable product contact material which does not absorb or transmit flavor or odor ingredients of citrus and other juices.

10 Heat-sealable low-density polyethylenes are well known to be components of current paperboard citrus juice cartons which provide little barrier to absorption and/or transmission of citrus juice essential flavor/aroma oils. Additionally, it is well known that impermeable materials such as aluminium foil, polar materials such as: polyamides, polyethylene terephthalates, polyvinylidene chlorides, polyvinyl chlorides, etc., and highly crystalline non-polar materials such as high-density polyethylene and polypropylene provide varying degrees of barrier to the absorption and/or transmission of non-polar citrus juice flavor oils such as d-limonene, et al. However, these materials could not be substituted for low density polyethylene since they lacked the requisite heat-sealability over a practical temperature range, necessary FDA clearance for direct contact to foods, stress cracking resistance and cutability during the scoring, and/or die cutting conversion processes. Due to the failures of these impermeable materials, past efforts have concentrated on using a combination of these flavor-oil resistant materials with low density polyethylene as the heat-sealable component.

20 The existing commercial structure for a paperboard carton for juice and similar products has utilized an easily heat-sealable barrier laminate composed of paperboard sandwiched between two layers of low density polyethylene (LDPE). The LDPE is an inexpensive heat-sealable moisture barrier. The conventional structure falters in that the LDPE layer absorbs the essential oils of the juice after short periods of time causing integrity decay of heat seals, stress cracking of the layer and allows transmission of the essential oils into the paperboard and to the atmosphere. Additionally, the conventional structure provides virtually no barrier resistance to oxygen causing the juice to lose Vitamin C in large amounts.

25 One other conventional structure adds two additional layers to the structure identified above, namely a foil layer and an additional LDPE layer. The expensive foil layer increases barrier resistance to the flow of oxygen, while the additional LDPE allows for ultimate heat-sealability of the laminate. The improved conventional structure has poor barrier properties relating to the absorption of essential oils and aromas, since the interior contacting layer is still LDPE.

30 The object of the present invention is to produce an improved juice packaging heat-sealable laminate material which does not absorb or transmit flavor/odour ingredients of citrus and other juices.

SUMMARY OF THE INVENTION

35 The preferred embodiment of the present invention reveals a heat-sealable barrier laminate providing a substantial barrier to the loss of Vitamin C and an almost complete barrier to the loss of essential flavor oils over the shelf life period of the carton (six weeks) and far beyond the six week period as well. The preferred embodiment comprises from the outer surface to the inner surface contacting the essential oils and/or flavors: an exterior layer of a low density polyethylene, a paperboard substrate, an interior layer of a low density polyethylene and a layer of gas barrier ethylene vinyl alcohol copolymer (EVOH) coated onto the interior layer of the low density polyethylene, in contact with the juice rendering the laminate heat-sealable.

The cartons constructed of the laminate of the present invention enable significant flavor oil retention of the citrus juice contained, and also significant prevention of loss of Vitamin C, resulting in a significant extension of the shelf life thereof and permits replacement of the costly aluminium foil barrier.

45 The preferred EVOH is sold under the product name Eval EP resins and is available from Eval Company of America.

The present invention has produced a suitable container which has excellent barrier properties utilizing a laminate which can be heat-sealed with its exterior and interior layers being a non-polar constituent (LDPE) and a polar constituent (EVOH) from front to back. The conventional theories have been that the laminate could not be heat-sealed on conventional apparatus at practical temperatures without having non-polar constituents on its ends. The liquid juice components are insoluble in the polar EVOH material, preventing flavor oil absorption and resulting swelling, stress cracking, and plasticization, heat seal degradation as occurs with LDPE as the contact layer.

The preferred laminate of the present invention not only exhibits significant barrier properties to extend the shelf life of the juice, but the laminate is produced using conventional extrusion equipment.

55 Stepwise, the paperboard is flame treated both sides, a layer of molten LDPE is placed onto the paperboard substrate by extrusion coating, the newly formed layer of LDPE is then corona discharge treated or flame treated in preparation for heat-sealing later in the process.

Secondly, the web is turned over and a layer of LDPE is extrusion coated onto the other exposed side of the paperboard substrate. This layer is also corona discharge treated or flame treated to facilitate adhesion to a subsequently applied gas-barrier EVOH layer.

Thirdly, a molten layer of gas barrier EVOH is extrusion coated onto the interior layer of LDPE. The completed laminate can now be heat-sealed from front to back (LDPE to EVOH) at conventional temperatures [122 to 260° C (250° F to 500° F)].

The newly formed laminate can then be scored, cut into blanks, folded and side-seam heat-sealed thereon for transport.

Once transported, the prepared blanks can be placed onto conventional equipment, such as a PurePak® machine made by Ex-Cell-O. The blanks are heat-sealed at the bottom, filled and heat-sealed at the top by the PurePak® (registered trade mark) machine to complete the filled carton.

The barrier laminate produced by the present invention not only exhibits excellent barrier properties and can be easily constructed but also meets FDA approval for use in food packaging. Eval Company of America's Eval (registered trade mark) EP is FDA approved for direct food contact and the preferred EVOH of the invention. Other gas barrier EVOH's which heat seal at low temperatures (121 to 260° C (250° F to 500° F)) and which can be cut on conventional machinery could also be used as the contacting barrier.

Thus, until the advent of the present invention no suitable containers for the containment of citrus juices have been developed which retain the advantages of using paperboard as the base material and is an FDA approved heat-sealable barrier laminate which is economical and can be formed using conventional extrusion coating equipment.

The present invention described herein is particularly useful as a paperboard laminate employed in the manufacture of citrus juice or other liquid containers. Such containers which make use of a heat-seal for seaming and closing such as folding boxes, square or rectangular containers or cartons, or even cylindrical tubes.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a cross-sectional elevation of an existing commercial structure of a laminate;
 FIG. 2 is a cross-sectional elevation of an existing commercial structure of a laminate;
 FIG. 3 is a cross-sectional elevation of an existing commercial structure of a laminate;
 FIG. 4 is a cross-sectional elevation of an existing commercial structure of a laminate;
 FIG. 5 is a cross-sectional elevation of the preferred embodiment of the laminate of the present invention;
 FIG. 6 is a cross-sectional elevation of an alternative embodiment of the laminate of the present invention;
 FIG. 7 is a cross-sectional elevation of an alternative embodiment of the laminate of the present invention;
 FIG. 8 is block diagram representing the process for making the preferred embodiment of the laminate of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

The existing commercial structure for a paperboard carton for juice and similar products has made use of an easily heat-sealed barrier laminate composed of paperboard 4 (FIG. 1) sandwiched between two layers of low density polyethylene (LDPE) 2, 6. The LDPE is an inexpensive heat-sealable material which acts only to a limited extent as a moisture barrier to prevent loss of essential oils (flavor) and aroma. The problem encountered with conventional laminate structure has been that the essential oils of the juice (namely - D Limonene) has, after short periods of time, been absorbed into the LDPE layer causing heat seal decay, stress cracking, and swelling while stripping the juice of the essential oils. Additionally, the conventional structure (FIG 1) provides virtually no barrier resistance to oxygen which causes the juice to lose Vitamin C in great quantities after a relatively short period of time. To illustrate, the conventional paperboard 1.89 liters (½ US gallon juice) carton will lose 60.5% of its essential oil (D-Limonene) and 84.5% of its Vitamin C content in a storage period of six weeks (SEE TABLE 1).

One conventional existing paperboard carton (FIG. 2) utilizes two additional layers in addition to the layers disclosed in FIG. 1 to add greater barrier resistance to the passage of oxygen and resultant loss of Vitamin C. Aluminum foil 14 has been added to the laminate structure to increase the barrier's resistance to the flow of oxygen. The additional layer of LDPE 16 is needed to allow the laminate to be heat-sealed from front to back with the exterior LDPE 8 layer. The structure of the barrier laminate (FIG. 2) has poor barrier properties relating to the absorption of essential oils and aromas, since the heat-sealable contacting layer is still low density polyethylene. The shelf storage life of the juice carton made up of the barrier laminate of FIG. 2 still exhibits a percentage loss of essential oils (D-Limonene) of 35.5%, while greatly improving its barrier properties with respect to the percentage loss of Vitamin C, 24% (See Table 1). The addition of the foil layer allows the laminate to exhibit excellent O₂ barrier properties. Although, the use of a foil layer is extremely beneficial, the increased expense makes the use of foil economically less desirable.

FIGS. 3 and 4 disclose structures of barrier laminates described in U.S. Patent 4,513,036. FIG. 3 discloses a barrier laminate comprising a sandwich of LDPE 18-paperboard 20-High Density Polyethylene (HDPE) 22-LDPE 24. The lam-

inate disclosed exhibits large losses of essential oils during its shelf life of six weeks, namely 60.5%, while also exhibiting large losses of Vitamin C during the six week period 87% (see Table 1). The economics and ease of fabrication of the laminates of FIG. 3 are outweighed by the poor barrier properties exhibited.

FIG. 4 discloses the preferred embodiment of U.S. Patent 4,513,036, namely a barrier laminate comprising LDPE 26-Paperboard 28-Polypropylene 30-LDPE 32. The additional polypropylene layer 30 adds to the barrier properties at relatively low additional costs. The barrier properties still are extremely deficient in its resistance to the passage of oxygen and its loss of Vitamin C, namely 71% after six weeks. The polypropylene laminate structure loses 39.5% of its essential oils (D-Limonene) after six weeks (see Table 1).

Both embodiments disclosed in the patent cited above do not adequately preserve the flavor/aroma and Vitamin C content of the juice. The structure of the existing commercial constructions have all faced the same problem due to the necessity for heat sealing the seams and closures while forming the carton blank and while filling the cartons with juice or the like. The necessity of forming a heat seal from the front to the back of the laminate has resulted in the use of an exterior layer of LDPE and an interior layer of LDPE, both non-polar compounds which exhibit excellent heat-sealing characteristics to one another (see FIGS. 1-4).

Referring to FIG. 5, the preferred embodiment of the laminate of the present invention is shown as comprising a paperboard substrate 36 which is most suitably high-grade paperboard stock, for example, 282 lb. Milk Carton Board, to which is applied on both sides a coating of low density polyethylene (LDPE) 34, 38 in a coating weight ranging from about 2.26 to about 17.12 kg (about 5 to about 40 pounds) per ream. Any commercial extrusion coating grade LDPE is suitable for use herein. On the back or interior portion of the laminate, namely onto LDPE layer 38 is applied a layer of EVOH 40. The EVOH being a heat-sealable layer composed of Eval Company of America's Eval EP resins.

Referring now to FIG. 8, wherein a block diagram discloses the method of forming the heat-sealable barrier laminate of Figure 5.

The laminate can be easily fabricated. The paperboard is flame treated both sides. Step (a), a molten layer of the LDPE 34 is extrusion coated onto the paperboard substrate 36. Step (b), the LDPE layer 34 is corona discharge or flame treated in preparation for subsequent heat-sealing Step (c), the web is turned over to facilitate Step (d), which has a layer of molten LDPE 38 extrusion coated onto the paperboard substrate 36. Step (e), LDPE layer 38 is corona discharge treated to facilitate the adhesion of a subsequent EVOH coating, and lastly, Step (f), a layer of EVOH 40 is extrusion coated onto LDPE layer 38 to complete the sandwich.

Referring now to FIG. 6, an alternative embodiment of the laminate of the present invention is shown. The embodiment adds an additional barrier layer which not only provides total containment of flavor oils, but also provides significant containment of Vitamin C. In this alternative embodiment, the paperboard substrate 44, is extrusion coated on the external surface thereof with a coating of heat-sealable LDPE 42. On the internal surface of the paperboard substrate 44 is applied a coating of LDPE 46. Overlying the LDPE web 46 is a layer of an oxygen barrier material 48. The oxygen barrier material can be any of the following group: foil, e.g. aluminium foil, polyacrylonitrile or its copolymers, polyethylene terephthalate or its copolymers e.g. glycol or acid modified polyethylene terephthalate polyvinylidene chloride or its copolymers, polyamide or its copolymers, polyvinyl alcohols or its copolymers, polyvinyl chloride or its copolymers or an additional layer of gas barrier EVOH. Overlying the barrier material is a layer of heat-sealable EVOH 50 which will ultimately form the internal surface of the container constructed therefrom.

To enhance the adhesion of the additional barrier layer 48 to the LDPE layer 46 and the EVOH layer 50, additional tie layers 47, 49 can be interposed therebetween. Adhesives which are extrudable or coextrudable, such as Dupont's CXA series or recent vintage Plexars® (registered trade mark) from Norchem are suitable choices. When using ethylene vinyl alcohol (EVOH) as both an oxygen barrier 48 and a heat seal layer 50 in FIG. 6, tie layer 47 can be eliminated by coextrusion coating an EVOH 48/tie layer 49/EVOH 50 composite extrudate onto LDPE layer 46 which has been previously flame or corona treated.

FIG. 7 reflects an embodiment similar to that of FIG. 5. Replacing the outer layer of a heat-sealable LDPE 34, is a blend layer 52 of EVOH and LDPE. The blend is made up of between five (5) to thirty (30) percent EVOH and the rest being LDPE. The laminate is comprised from outside to inside: LDPE/EVOH Blend 52-PAPERBOARD SUBSTRATE 54-LDPE 56-EVOH 58. The advantage of the LDPE/EVOH blend layer is that it eliminates the need for extensive surface treatment prior to heat sealing.

Although specific coating techniques have been described, any appropriate technique for applying the layers onto the paperboard substrate can be suitably employed, such as extrusion, coextrusion, or adhesive lamination or single and/or multilayer films to paperboard to achieve the stated inventions of this patent.

The unique barrier effect provided by the laminate of the present invention to the % loss of essential oils and to the % loss of Vitamin C is clearly demonstrated by the following example outlined in Table 1.

Standard 1.89 liters (½ US gallon) juice containers were prepared and filled with juice. A typical essential oil in the juice was d-limonene. The filled cartons were stored for a test period of six weeks after which the juice was analyzed to determine the percentage loss by weight of the essential oil d-limonene and the percentage loss by weight of Vitamin C.

The six cartons tested were those shown in FIGS. 1-6 and described herein.

TABLE 1

Test Sample 1,89 liters (½ US Gallon) Juice Container	% Loss of Essential Oil	% Loss of Vitamin C
LDPE-BOARD-LDPE (FIG. 1)	60.5	84
LDPE-BOARD-LDPE-FOIL-LDPE (FIG. 2)	35.5	24
LDPE-BOARD-HDPE-LDPE (FIG. 3)	60.5	87
LDPE-BOARD-POLYPROPYLENE-LDPE (FIG. 4)	39.5	71
LDPE-BOARD-LDPE-EVOH (FIG. 5)	0*	30
LDPE-BOARD-LDPE-EVOH-Tie Layer-EVOH (FIG. 6 with tie layer)	0*	24

*Less than one percent

It can be clearly seen that the container prepared from a laminate of the present invention provides an almost complete barrier to the loss of essential oils far greater than has been present in existing structures comprising LDPE heat seal layers. Additionally, the oxygen passage or percentage loss of Vitamin C has been greatly reduced over all prior laminates not containing aluminum foil.

The effectiveness of the laminate of the present invention as a barrier to migration of essential oils and flavors, as well as a barrier to a loss of Vitamin C permits a significant extension of shelf life of containers constructed therefrom.

Claims

1. A container for liquids containing essential oils and/or flavours, said container being constructed from a laminate comprising:

- a) a paperboard substrate having an outer surface and an inner surface;
- b) an outer layer of a heat-sealable low density polyethylene polymer coated on said outer surface of said paperboard substrate;
- c) an inner layer of a heat-sealable low density polyethylene polymer coated on said inner surface of said paperboard substrate; and
- d) a liquid-contact layer of gas barrier ethylene vinyl alcohol copolymer heat-sealable with the outer layer of low density polyethylene on conventional equipment at temperatures ranging from 121°C - 260°C (250°F - 500°F), extrusion coated on the surface of said inner layer of said polyethylene polymer remote from the paperboard substrate, and acting as a barrier to the transit of oxygen and essential oils and flavours therethrough.

2. The container as claimed in claim 1 wherein said outer layer of low density polyethylene polymer is corona discharge treated to enhance heat-sealability of said laminate.

3. The container as claimed in claim 1 wherein said outer layer of low density polyethylene polymer is flame treated to enhance heat-sealability of said laminate.

4. The container as claimed in any preceding claim wherein said surface of said inner layer of said heat-sealable low density polyethylene polymer is corona discharge treated to enhance adhesion of said heat-sealable gas barrier ethylene vinyl alcohol copolymer layer.

5. The container as claimed in any of claims 1 to 3 wherein said surface of said inner layer of said heat-sealable low density polyethylene polymer is flame treated to enhance adhesion of said heat-sealable gas barrier ethylene vinyl alcohol copolymer layer.

6. A container for liquids containing essential oils and/or flavours, said container being constructed from a laminate comprising:

- a) a paperboard substrate having an outer surface and an inner surface;

b) an outer layer of a heat-sealable low density polyethylene polymer coated on said outer surface of said paperboard substrate;

c) an inner layer of a heat-sealable low density polyethylene polymer coated on said inner surface of said paperboard substrate;

d) an oxygen barrier material layer coated on the surface of said inner layer of said polyethylene polymer remote from the paperboard substrate;

e) a tie layer coated on the surface of said oxygen barrier material remote from the inner layer of polyethylene polymer; and

f) a liquid-contact layer of gas barrier ethylene vinyl alcohol copolymer extrusion coated on the surface of said tie layer remote from the oxygen barrier material layer, heat-sealable with the outer layer of low density polyethylene on conventional equipment at temperatures ranging from 121 to 260°C (250°F - 500°F), and acting as a barrier to the transport of oxygen and essential oils and flavours therethrough.

7. The container as claimed in claim 6 wherein said oxygen barrier material layer is gas barrier ethylene vinyl alcohol copolymer.

8. The container as claimed in claim 6 wherein said oxygen barrier material layer is a polyvinyl alcohol.

9. The container as claimed in claim 6 wherein said oxygen barrier material layer is a layer of aluminum foil.

10. The container as claimed in claim 6 wherein said oxygen barrier material layer is a layer of polyethylene terephthalate.

11. The container as claimed in claim 6 wherein said oxygen barrier material layer is a layer of glycol modified polyethylene terephthalate.

12. The container as claimed in claim 6 wherein said oxygen barrier material layer is a layer of acid modified polyethylene terephthalate.

13. The container as claimed in claim 6 wherein said oxygen barrier material layer is a layer of polyvinylidene chloride.

14. The container as claimed in claim 6 wherein said oxygen barrier material layer is a layer of vinylidene chloride copolymer.

15. The container as claimed in claim 6 wherein said oxygen barrier material layer is a layer of polyvinyl chloride polymer.

16. The container as claimed in claim 6 wherein said oxygen barrier material layer is a layer of vinyl chloride copolymer.

17. The container as claimed in claim 6 wherein said oxygen barrier material layer is a layer of polyamide.

18. The container as claimed in claim 6 wherein said oxygen barrier material layer is a layer of polyamide copolymers.

19. A container for liquids containing essential oils and/or flavours, said container being constructed from a laminate comprising:

a) a paperboard substrate having an inner surface and an outer surface;

b) an outer layer of a heat-sealable gas barrier ethylene vinyl alcohol copolymer low density polyethylene blend coated on said outer surface of said paperboard substrate;

c) an inner layer of a heat-sealable low density polyethylene polymer coated on said inner surface of said paperboard substrate; and

d) a liquid contact layer of a gas barrier ethylene vinyl alcohol copolymer coated on the surface of said inner layer of said polyethylene polymer remote from the paperboard substrate, heat sealable with the outer layer of low density polyethylene on conventional equipment at temperatures ranging from 121 to 260°C (250 - 500°F), and acting as a barrier to the transport of oxygen and essential oils and flavours therethrough.

20. The container as claimed in claim 19 wherein said inner layer of said low-density polyethylene polymer is corona discharge treated to enhance adhesion of said subsequently applied heat-sealable gas barrier ethylene vinyl alcohol copolymer coating.

21. The container as claimed in claim 19 wherein said inner layer of said low-density polyethylene polymer is flame treated to enhance adhesion of said subsequently applied heat-sealable gas barrier ethylene vinyl alcohol copolymer coating.

5 Patentansprüche

1. Behälter für Flüssigkeiten, die etherische Öle und bzw. oder Aromastoffe enthalten, wobei der Behälter aus einem Laminat hergestellt ist, das folgende Bestandteile umfaßt:

- 10 a) ein Pappsubstrat mit einer Außen- und einer Innenfläche;
 b) eine äußere Schicht aus einem heißsiegelfähigen Kunststoff aus Polyethylen niederer Dichte, die auf die Außenfläche des Pappsubstrats aufgebracht ist;
 c) eine innere Schicht aus einem heißsiegelfähigen Kunststoff aus Polyethylen niederer Dichte, die auf die Innenfläche des Pappsubstrats aufgebracht ist; und
 15 d) eine mit der Flüssigkeit in Berührung tretende Schicht aus einem als Gasbarriere wirkenden, mit der äußeren Schicht aus Polyethylen niederer Dichte in einer herkömmlichen Einrichtung bei Temperaturen von 121°C - 260°C (250°F - 500°F) heißsiegelfähigen Ethylen-Vinylalkohol-Copolymerisat, die auf die vom Pappsubstrat abgewandte Oberfläche der inneren Schicht aus dem Kunststoff aus Polyethylen durch Extrusion aufgebracht ist und als Barriere gegen den Durchgang von Sauerstoff, etherischen Ölen und Aromastoffen wirkt.

- 20 2. Behälter gemäß Anspruch 1, wobei die äußere Schicht aus einem Kunststoff aus Polyethylen niederer Dichte zur Verbesserung der Heißsiegelfähigkeit des Laminats mit einer Koronaentladung behandelt worden ist.

- 25 3. Behälter gemäß Anspruch 1, wobei die äußere Schicht aus einem Kunststoff aus Polyethylen niederer Dichte zur Verbesserung der Heißsiegelfähigkeit des Laminats einer Flammenbehandlung unterzogen worden ist.

- 30 4. Behälter gemäß einem der vorhergehenden Ansprüche, wobei die Oberfläche der inneren Schicht aus dem heißsiegelfähigen Kunststoff aus Polyethylen niederer Dichte zur Verbesserung der Haftung der heißsiegelfähigen, als Gasbarriere wirkenden Schicht aus Ethylen-Vinylalkohol-Copolymerisat einer Koronaentladung behandelt worden ist.

- 35 5. Behälter gemäß einem der Ansprüche 1 bis 3, wobei die Oberfläche der inneren Schicht aus dem heißsiegelfähigen Kunststoff aus Polyethylen niederer Dichte zur Verbesserung der Haftung der heißsiegelfähigen, als Gasbarriere wirkenden Schicht aus Ethylen-Vinylalkohol-Copolymerisat einer Flammenbehandlung unterzogen worden ist.

6. Behälter für Flüssigkeiten, die etherische Öle und bzw. oder Aromastoffe enthalten, wobei der Behälter aus einem Laminat hergestellt ist, das folgende Bestandteile umfaßt:

- 40 a) ein Pappsubstrat mit einer Außen- und einer Innenfläche;
 b) eine äußere Schicht aus einem heißsiegelfähigen Kunststoff aus Polyethylen niederer Dichte, die auf die Außenfläche des Pappsubstrats aufgebracht ist;
 c) eine innere Schicht aus einem heißsiegelfähigen Kunststoff aus Polyethylen niederer Dichte, die auf die Innenfläche des Pappsubstrats aufgebracht ist;
 45 d) eine Schicht aus Barrierenmaterial für Sauerstoff, die auf die vom Pappsubstrat abgewandte Oberfläche der inneren Schicht aus dem Kunststoff aus Polyethylen aufgebracht ist;
 e) eine Bindschicht, die auf die von der inneren Schicht aus Kunststoff aus Polyethylen abgewandte Oberfläche des Barrierenmaterials für Sauerstoff aufgebracht ist; und
 50 f) eine mit der Flüssigkeit in Berührung tretende Schicht aus einem als Gasbarriere wirkenden Ethylen-Vinylalkohol-Copolymerisat, die auf die von der Schicht aus Barrierenmaterial für Sauerstoff abgewandte Oberfläche der Bindschicht durch Extrusion aufgebracht ist, mit der äußeren Schicht aus Polyethylen niedriger Dichte in einer herkömmlichen Einrichtung bei Temperaturen von 121 bis 260°C (250°F - 500°F) heißsiegelfähig ist und als Barriere gegen den Transport von Sauerstoff, etherischen Ölen und Aromastoffen wirkt.

- 55 7. Behälter gemäß Anspruch 6, wobei die Schicht aus Barrierenmaterial für Sauerstoff aus als Gasbarriere wirkendem Ethylen-Vinylalkohol-Copolymerisat besteht.

8. Behälter gemäß Anspruch 6, wobei die Schicht aus Barrierenmaterial für Sauerstoff aus Polyvinylalkohol besteht.

9. Behälter gemäß Anspruch 6, wobei die Schicht aus Barrierenmaterial für Sauerstoff aus Aluminiumfolie besteht.
10. Behälter gemäß Anspruch 6, wobei die Schicht aus Barrierenmaterial für Sauerstoff aus Polyethylenterephthalat besteht.
11. Behälter gemäß Anspruch 6, wobei die Schicht aus Barrierenmaterial für Sauerstoff aus mit Glykol modifiziertem Polyethylenterephthalat besteht.
12. Behälter gemäß Anspruch 6, wobei die Schicht aus Barrierenmaterial für Sauerstoff aus mit Säure modifiziertem Polyethylenterephthalat besteht.
13. Behälter gemäß Anspruch 6, wobei die Schicht aus Barrierenmaterial für Sauerstoff aus Polyvinylidenchlorid besteht.
14. Behälter gemäß Anspruch 6, wobei die Schicht aus Barrierenmaterial für Sauerstoff aus Vinylidenchlorid-Copolymerisat besteht.
15. Behälter gemäß Anspruch 6, wobei die Schicht aus Barrierenmaterial für Sauerstoff aus Polyvinylchlorid besteht.
16. Behälter gemäß Anspruch 6, wobei die Schicht aus Barrierenmaterial für Sauerstoff aus Vinylchlorid-Copolymerisat besteht.
17. Behälter gemäß Anspruch 6, wobei die Schicht aus Barrierenmaterial für Sauerstoff aus Polyamid besteht.
18. Behälter gemäß Anspruch 6, wobei die Schicht aus Barrierenmaterial für Sauerstoff aus Polyamid-Copolymeren besteht.
19. Behälter für Flüssigkeiten, die etherische Öle und bzw. oder Aromastoffe enthalten, wobei der Behälter aus einem Laminat hergestellt ist, das folgende Bestandteile umfaßt:
 - a) ein Pappsubstrat mit einer Innen- und einer Außenfläche;
 - b) eine äußere Schicht aus einer heißsiegelfähigen, als Gasbarriere wirkenden Legierung aus EthylenVinylalkohol-Copolymerisat und Polyethylen niedriger Dichte, die auf die Außenfläche des Pappsubstrats aufgebracht ist;
 - c) eine innere Schicht aus einem heißsiegelfähigen Kunststoff aus Polyethylen niedriger Dichte, die auf die Innenfläche des Pappsubstrats aufgebracht ist; und
 - d) eine mit der Flüssigkeit in Berührung tretende Schicht aus einem als Gasbarriere wirkenden Ethylen-Vinylalkohol-Copolymerisat, die auf die vom Pappsubstrat abgewandte Oberfläche der inneren Schicht aus dem Kunststoff aus Polyethylen durch Extrusion aufgebracht ist, mit der äußeren Schicht aus Polyethylen niedriger Dichte in einer herkömmlichen Einrichtung bei Temperaturen von 121 bis 260°C (250 - 500°F) heißsiegelfähig ist und als Barriere gegen den Transport von Sauerstoff, etherischen Ölen und Aromastoffen wirkt.
20. Behälter gemäß Anspruch 19, wobei die innere Schicht aus dem Kunststoff aus Polyethylen niedriger Dichte zur Verbesserung der Haftung der nachfolgend aufgetragenen heißsiegelfähigen, als Gasbarriere wirkenden Beschichtung aus Ethylen-Vinylalkohol-Copolymerisat mit einer Koronaentladung behandelt worden ist.
21. Behälter gemäß Anspruch 19, wobei die innere Schicht aus dem Kunststoff aus Polyethylen niedriger Dichte zur Verbesserung der Haftung der nachfolgend aufgetragenen heißsiegelfähigen, als Gasbarriere wirkenden Beschichtung aus Ethylen-Vinylalkohol-Copolymerisat einer Flammenbehandlung unterzogen worden ist.

Revendications

1. Récipient pour liquides contenant des huiles essentielles et/ou des matières odoriférantes, ledit récipient étant construit à partir d'un stratifié comprenant:
 - a) un substrat en carton ayant une surface externe et une surface interne;
 - b) une couche externe de polymère polyéthylène basse densité thermosoudable appliquée sur ladite surface externe dudit substrat en carton;

c) une couche interne de polymère polyéthylène basse densité thermosoudable appliquée sur ladite surface interne dudit substrat en carton; et

d) une couche de contact avec un liquide de copolymère éthylène/alcool vinylique formant une barrière aux gaz, thermosoudable avec la couche externe de polyéthylène basse densité sur un équipement conventionnel à des températures comprises entre 121 et 260°C (250 et 500°F), appliquée par extrusion sur la surface de ladite couche interne dudit polymère polyéthylène distante du substrat en carton, et agissant comme une barrière contre le transport d'oxygène et d'huiles essentielles/matières odoriférantes à travers elle.

2. Récipient selon la revendication 1, dans lequel ladite couche externe de polymère polyéthylène basse densité est traitée par décharge corona pour améliorer l'aptitude au thermosoudage dudit stratifié.

3. Récipient selon la revendication 1, dans lequel ladite surface de ladite couche externe dudit polymère polyéthylène basse densité est traitée à la flamme pour améliorer l'aptitude au thermosoudage dudit stratifié.

4. Récipient selon l'une quelconque des revendications précédentes, dans lequel ladite surface de ladite couche interne dudit polymère polyéthylène basse densité thermosoudable est traitée par décharge corona pour améliorer l'adhérence de ladite couche de copolymère éthylène/alcool vinylique thermosoudable formant une barrière aux gaz.

5. Récipient selon l'une quelconque des revendications 1 à 3, dans lequel ladite surface de ladite couche interne dudit polymère polyéthylène basse densité thermosoudable est traitée à la flamme pour améliorer l'adhérence de ladite couche de copolymère éthylène/alcool vinylique thermosoudable formant une barrière aux gaz.

6. Récipient pour liquides contenant des huiles essentielles et/ou des matières odoriférantes, ledit récipient étant construit à partir d'un stratifié comprenant:

a) un substrat en carton ayant une surface externe et une surface interne;

b) une couche externe de polymère polyéthylène basse densité thermosoudable appliquée sur ladite surface externe dudit substrat en carton;

c) une couche interne de polymère polyéthylène basse densité thermosoudable appliquée sur ladite surface interne dudit substrat en carton;

d) une couche de matériau formant une barrière à l'oxygène appliquée sur la surface de ladite couche interne dudit polymère polyéthylène distante du substrat en carton;

e) une couche de liaison appliquée sur la surface de ladite matière formant une barrière à l'oxygène distante de la couche interne de polymère polyéthylène; et

f) une couche de contact avec un liquide de copolymère éthylène/alcool vinylique, appliquée par extrusion sur la surface de ladite couche de liaison distante de la couche de matériau formant une barrière à l'oxygène, thermosoudable avec la couche externe de polyéthylène basse densité sur un équipement conventionnel à des températures comprises entre 121 et 260°C (250 et 500°F), et agissant comme une barrière contre le transport d'oxygène et d'huiles essentielles/matières odoriférantes à travers elle.

7. Récipient selon la revendication 6, dans lequel ladite couche de matériau formant une barrière à l'oxygène est un copolymère éthylène/alcool vinylique formant une barrière aux gaz.

8. Récipient selon la revendication 6, dans lequel ladite couche de matériau formant une barrière à l'oxygène est un alcool polyvinylique.

9. Récipient selon la revendication 6, dans lequel ladite couche de matériau formant une barrière à l'oxygène est une couche de feuille d'aluminium.

10. Récipient selon la revendication 6, dans lequel ladite couche de matériau formant une barrière à l'oxygène est une couche de polyéthylène-téréphtalate.

11. Récipient selon la revendication 6, dans lequel ladite couche de matériau formant une barrière à l'oxygène est une couche de polyéthylène-téréphtalate modifié par un glycol.

12. Récipient selon la revendication 6, dans lequel ladite couche de matériau formant une barrière à l'oxygène est une couche de polyéthylène-téréphtalate modifié par un acide.

13. Récipient selon la revendication 6, dans lequel ladite couche de matériau formant une barrière à l'oxygène est une couche de chlorure de polyvinylidène.
- 5 14. Récipient selon la revendication 6, dans lequel ladite couche de matériau formant une barrière à l'oxygène est une couche de copolymère de chlorure de vinylidène.
- 15 15. Récipient selon la revendication 6, dans lequel ladite couche de matériau formant une barrière à l'oxygène est une couche de polymère chlorure de polyvinyle.
- 10 16. Récipient selon la revendication 6, dans lequel ladite couche de matériau formant une barrière à l'oxygène est une couche de copolymère de chlorure de vinyle.
- 15 17. Récipient selon la revendication 6, dans lequel ladite couche de matériau formant une barrière à l'oxygène est une couche de polyamide.
18. Récipient selon la revendication 6, dans lequel ladite couche de matériau formant une barrière à l'oxygène est une couche copolymères de polyamide.
- 20 19. Récipient pour liquides contenant des huiles essentielles et/ou des matières odoriférantes, ledit récipient étant construit à partir d'un stratifié comprenant:
 - a) un substrat en carton ayant une surface interne et une surface externe;
 - b) une couche externe d'un mélange copolymère éthylène/alcool vinylique/polyéthylène basse densité thermosoudable formant une barrière aux gaz, appliquée sur ladite surface externe dudit substrat en carton;
 - 25 c) une couche interne de polymère polyéthylène basse densité thermosoudable appliquée sur ladite surface interne dudit substrat en carton; et
 - d) une couche de contact avec un liquide d'un copolymère éthylène/alcool vinylique formant une barrière aux gaz, appliquée sur la surface de ladite couche interne dudit polymère polyéthylène distante dudit substrat en carton, thermosoudable avec la couche externe de polyéthylène basse densité sur un équipement conventionnel à des températures comprises entre 121 et 260°C (250 et 500°F), et agissant comme une barrière contre le transport d'oxygène et d'huiles essentielles/matières odoriférantes à travers elle.
- 30 20. Récipient selon la revendication 19, dans lequel ladite couche interne dudit polymère polyéthylène basse densité est traitée par décharge corona pour améliorer l'adhérence dudit revêtement de copolymère éthylène/alcool vinylique thermosoudable, formant une barrière aux gaz, appliqué par la suite.
- 35 21. Récipient selon la revendication 19, dans lequel ladite couche interne dudit polymère polyéthylène basse densité est traitée à la flamme pour améliorer l'adhérence dudit revêtement de copolymère éthylène/alcool vinylique thermosoudable, formant une barrière aux gaz, appliqué par la suite.

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FIG. 1.

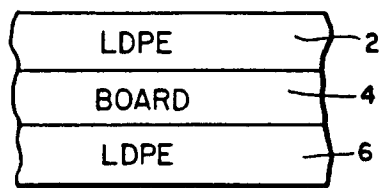
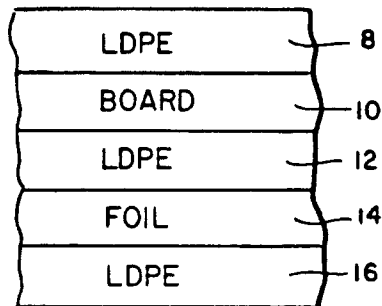
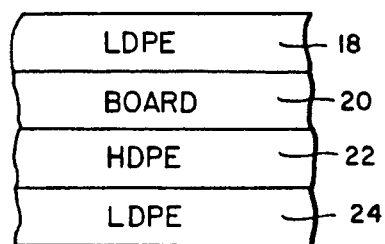


FIG. 2.



EXISTING
COMMERCIAL
STRUCTURES

FIG. 3.



CHAMPION
PATENT

FIG. 4.

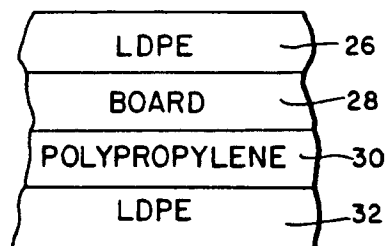


FIG. 6.

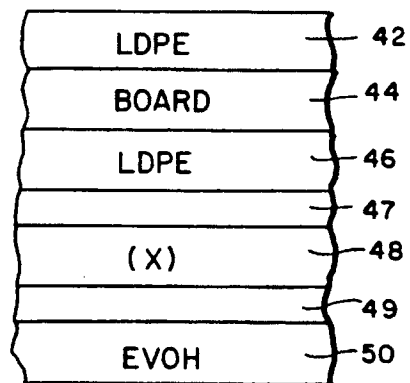


FIG. 5.

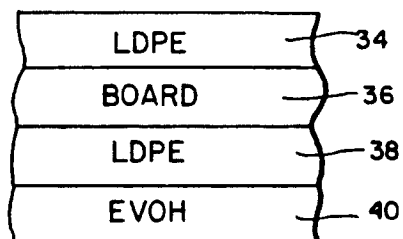


FIG. 7.

